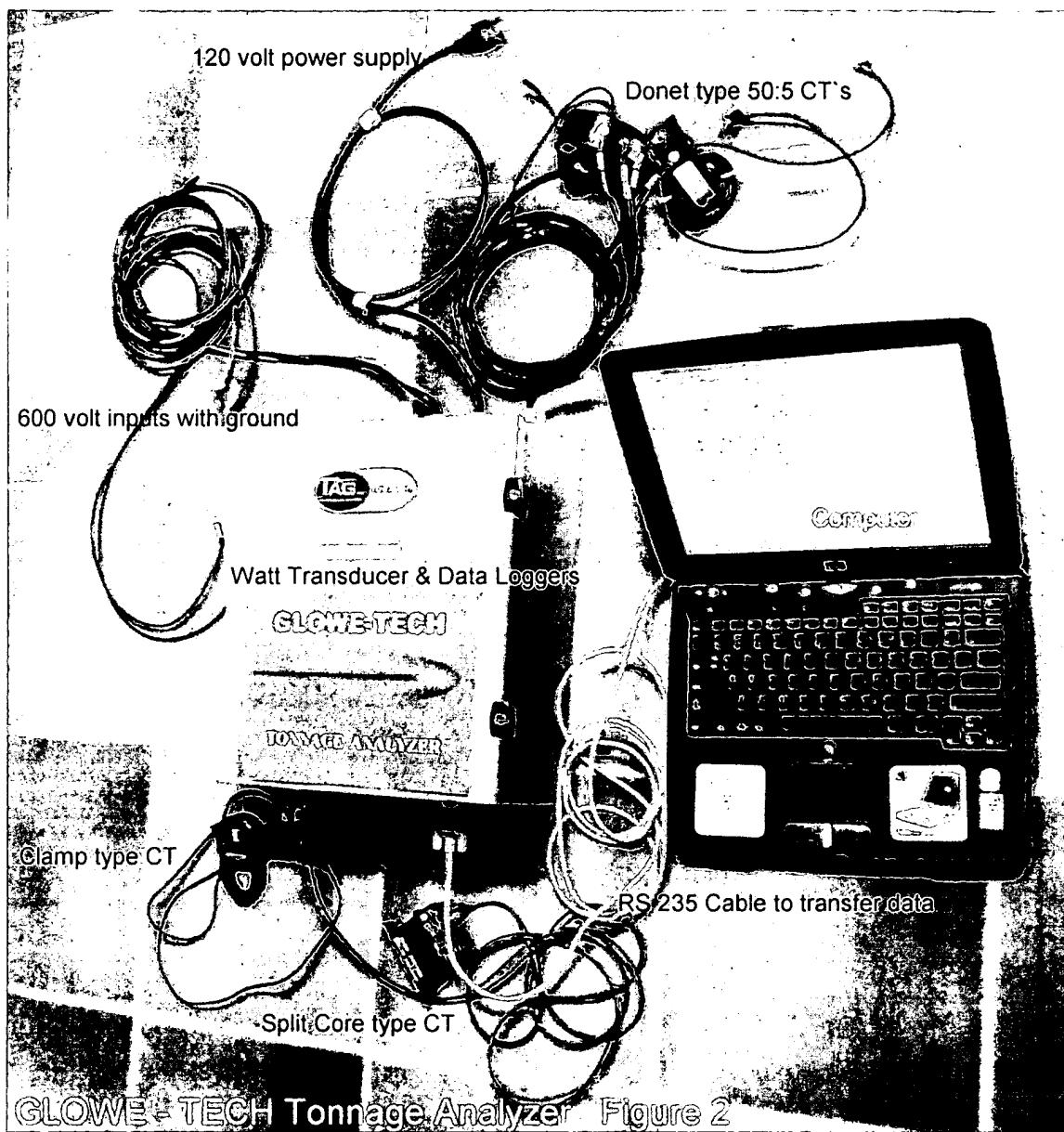


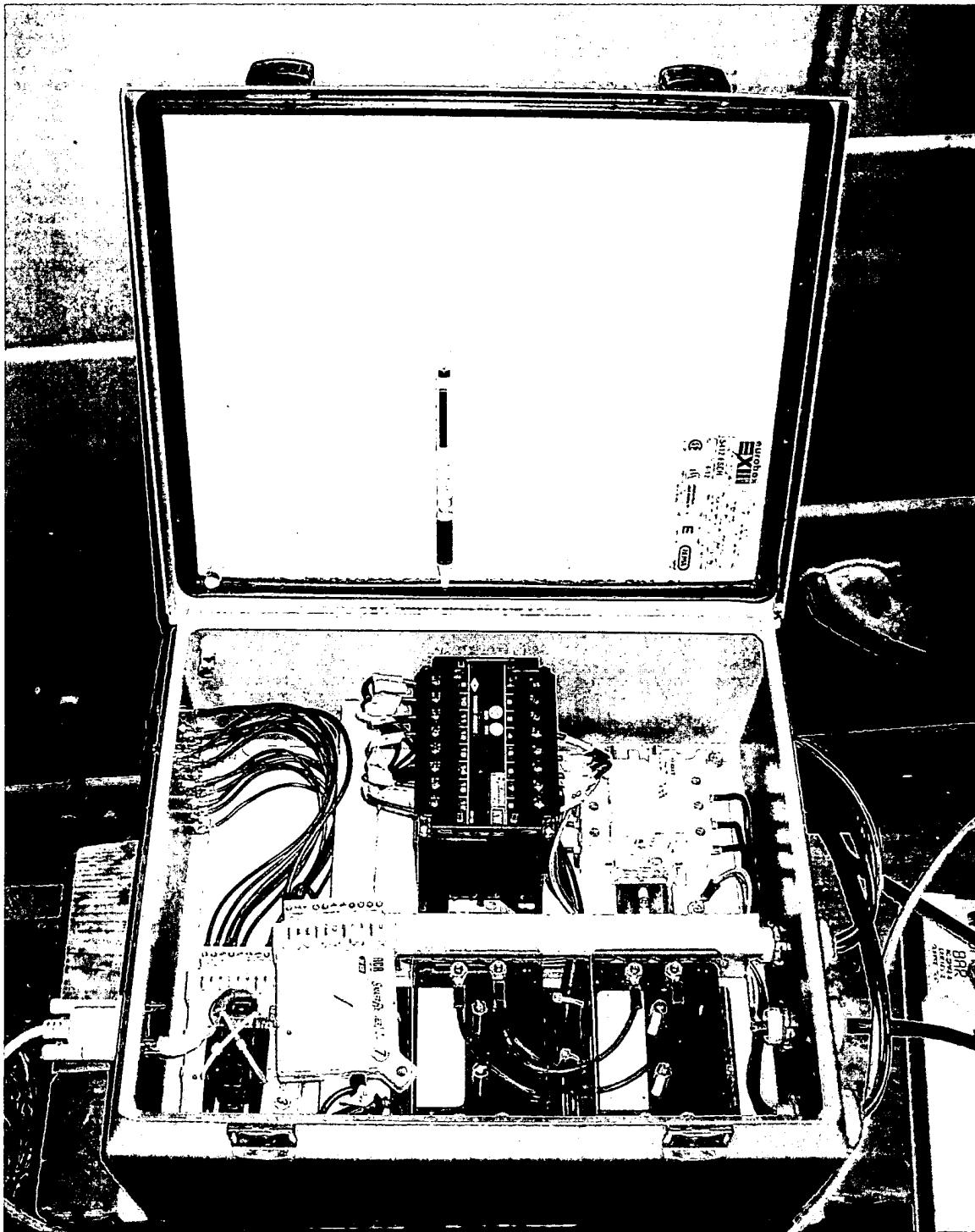
**FIGURE 1**

Typical set-up with computer recording live data converted to tonnage with belt scale monitor (top unit) showing actual tonnage moving over conveyor

**FIGURE: 2**



- Item 1: 600 volt input wires for line 1, 2 & 3 for watt transducer & ground wire**
- Item 2: Donut type 50:5 CT's for current input to watt transducer**
- Item 3: 120 volt power supply wire for watt transducer**
- Item 4: Clamp type CT for ampere method to collect data for tonnage conversion**
- Item 5: Split-Core CT for ampere method to collect data for tonnage conversion**
- Item 6: Instrument case with Watt Transducer installed**
- Item 7: Instrument case with ACR Data logger installed**
- Item 8: RS235 Cable to transfer data to computer**
- Item 9: Lap-top computer to collect data**
- Item 10: Screen showing live data and for display of Real-Time graph of data in Tonnes converted from kilowatts or amps**



**FIGURE 3:**

**GLOWE-TECH Tonnage Analyzer – Portable model with 2 Data Loggers capable of monitoring up to a total of 14 conveyor motors**

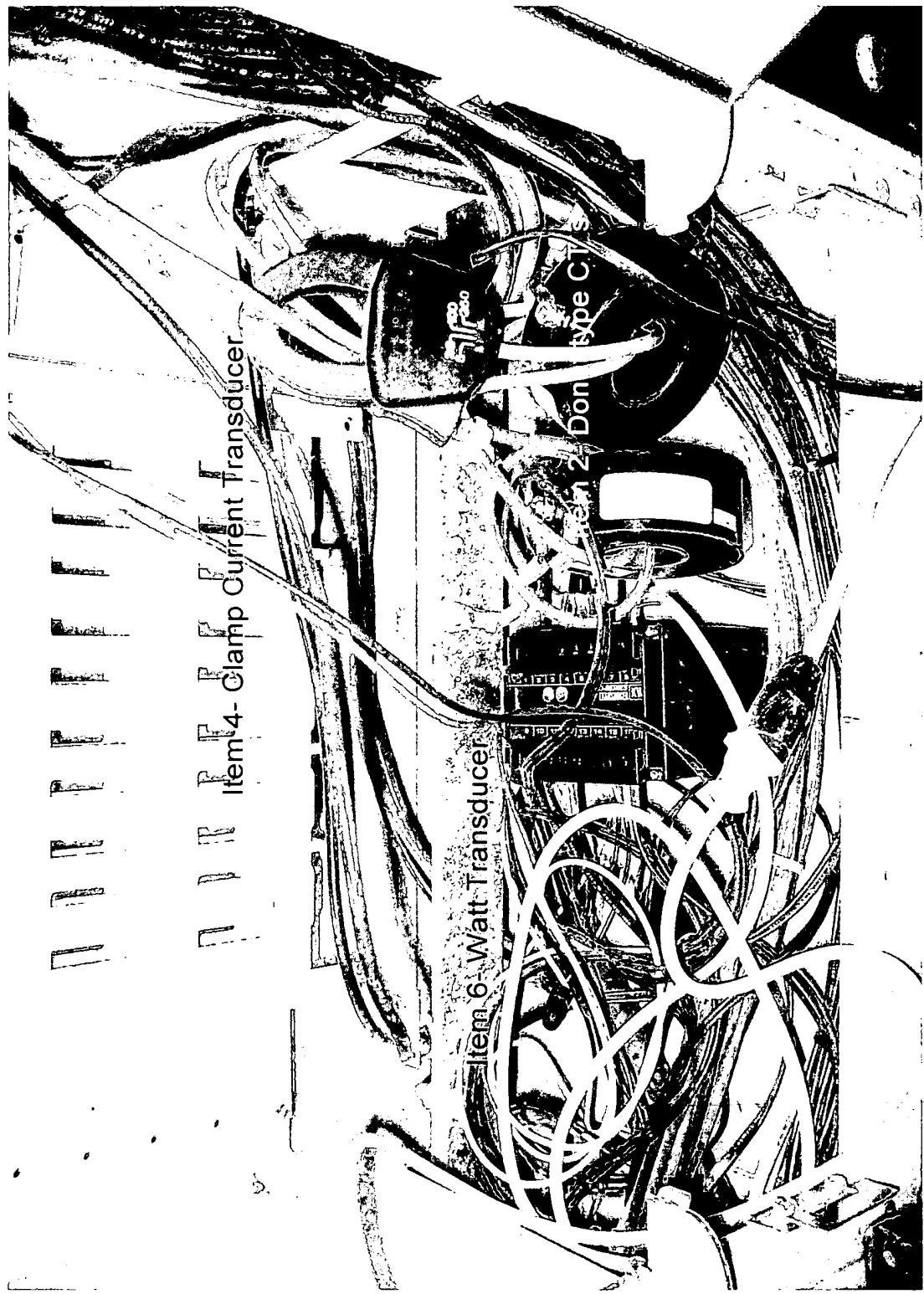


FIGURE 3b: Watt Transducer installation for Typical Conveyor Motor showing Clamp CT installed too

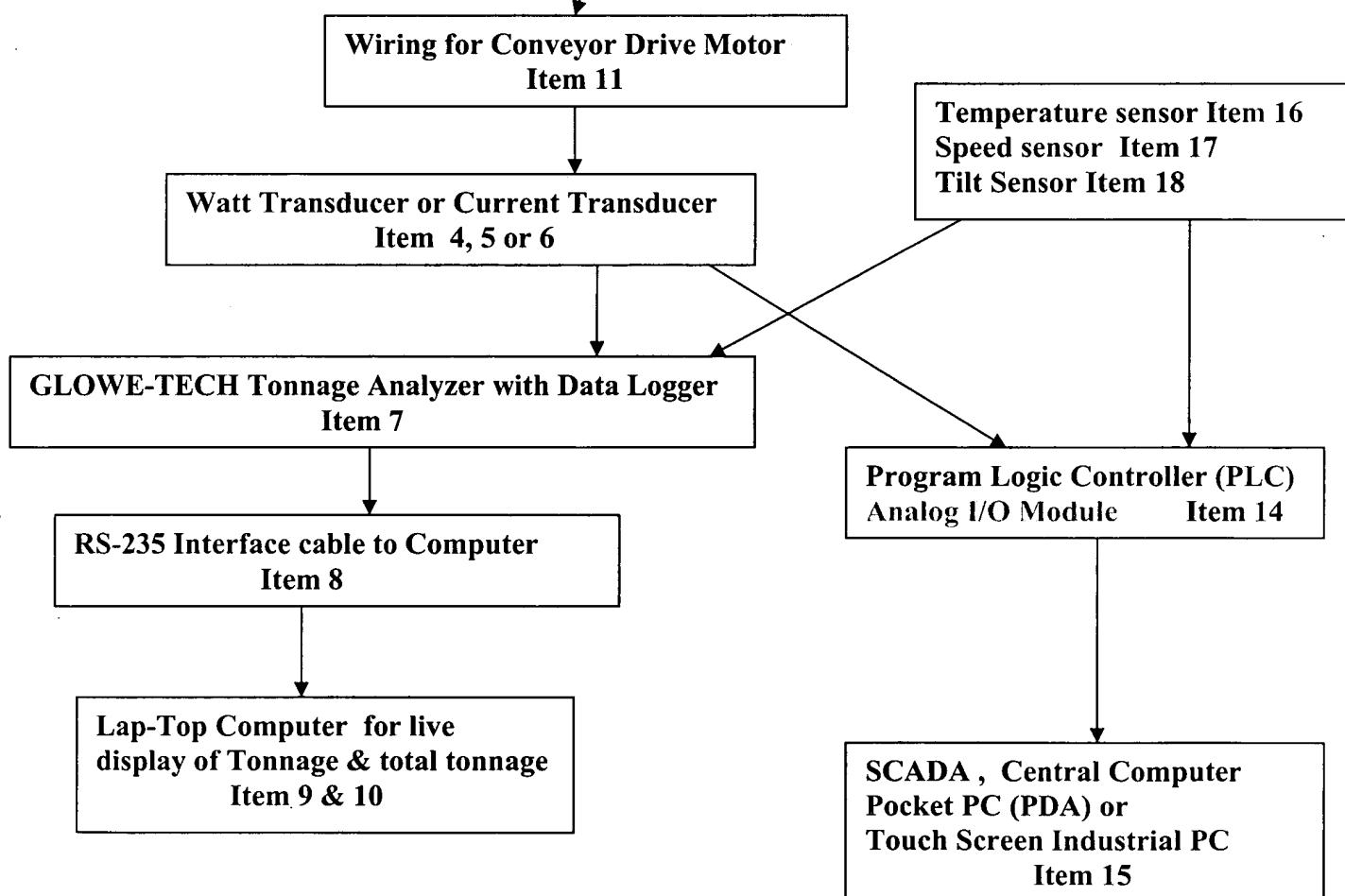
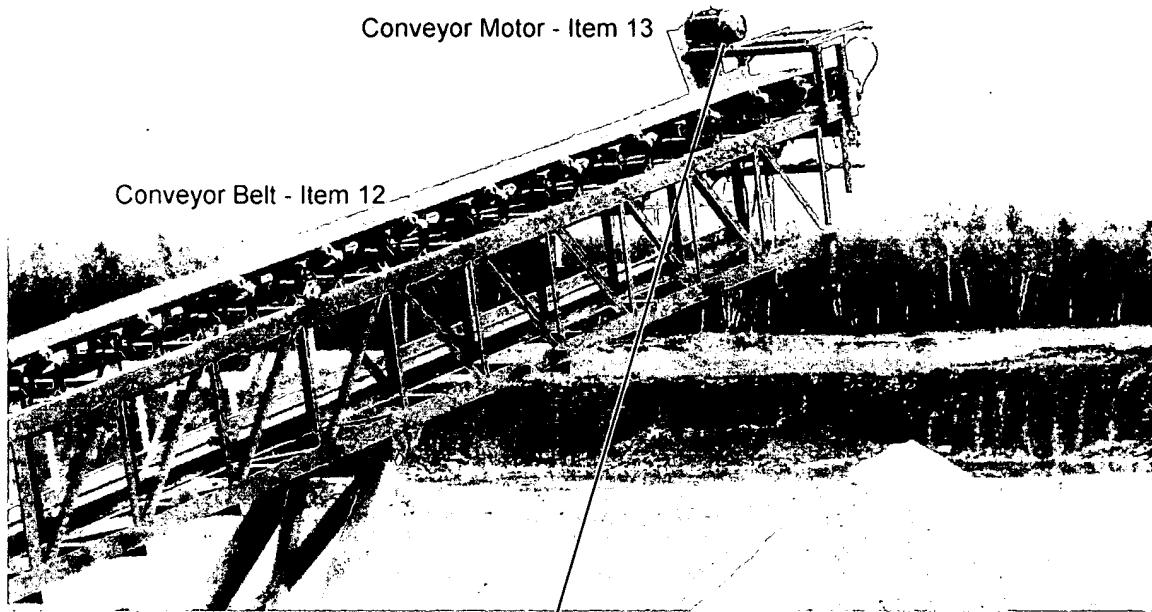
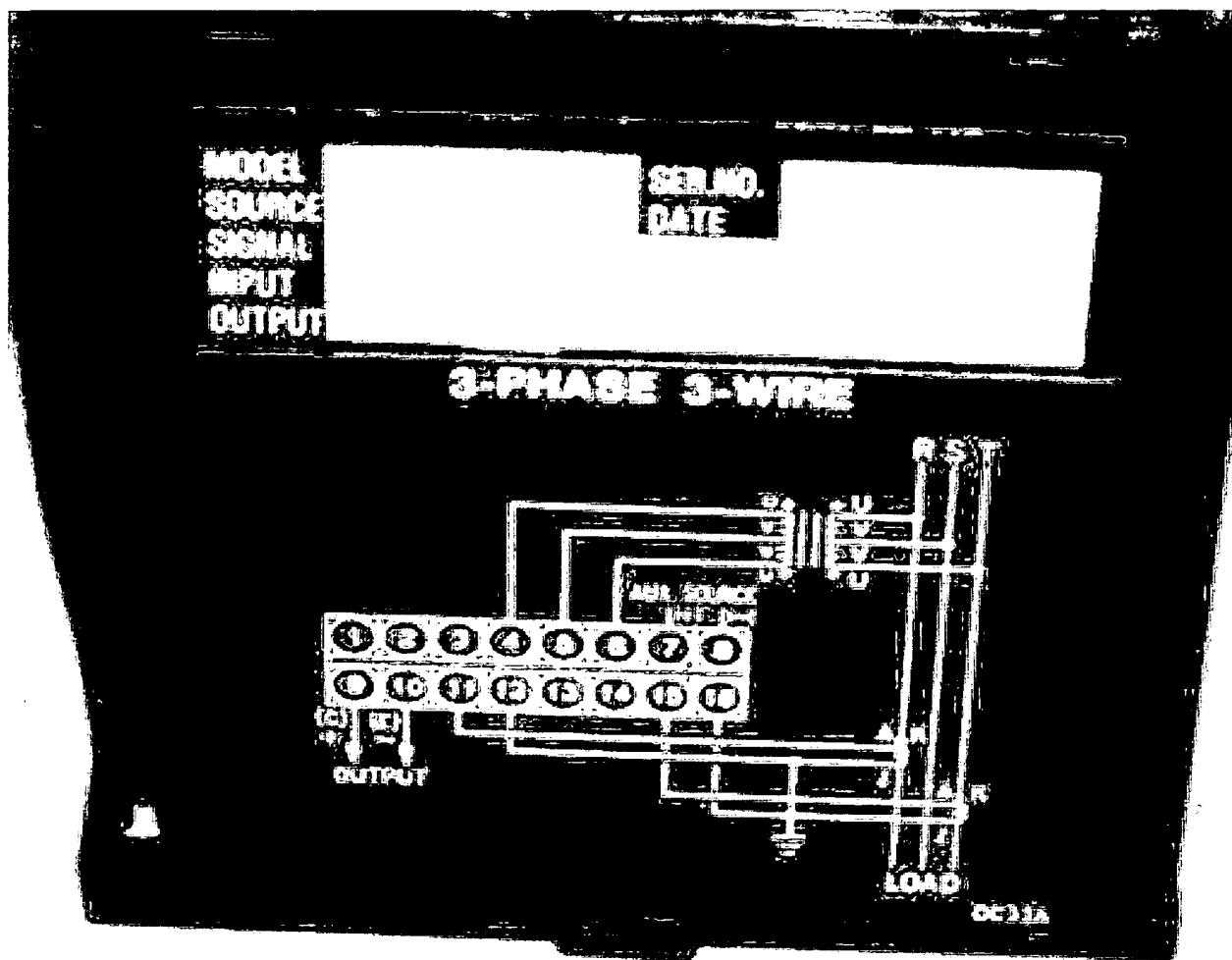


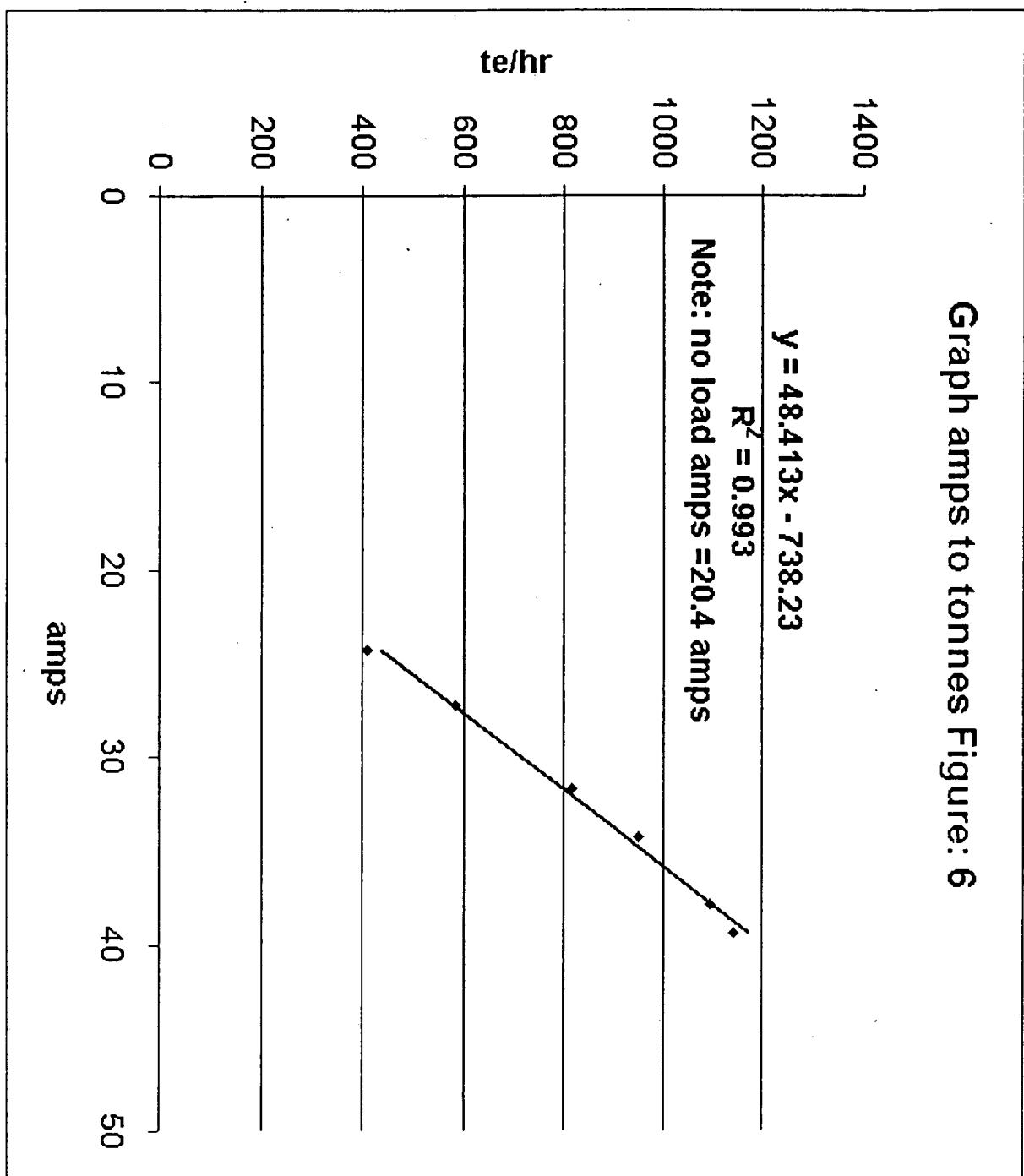
FIGURE: 4 Schematic of Typical Conveyor Belt Motor Tonnage Conversion



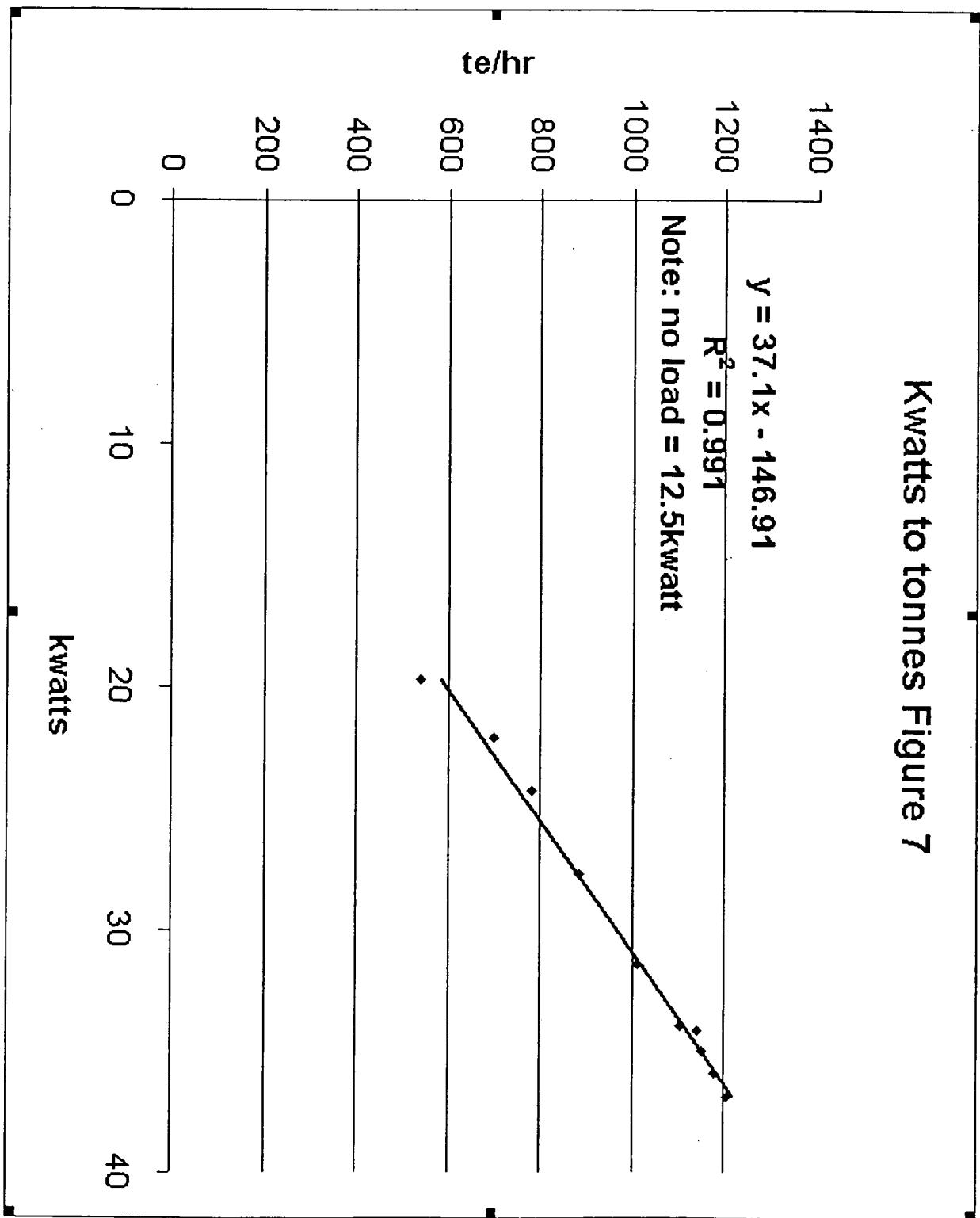
**FIGURE: 5**

**GLOWE-TECH Typical wiring diagram for Watt Transducer**

Graph amps to tonnes Figure: 6



Kwatts to tonnes Figure 7



## FIGURE: 8

### Summary of Tonnage for Typical Conveyor using kwatts to tonnes

Date	Truck Count	actual Belt Scale tonnes	Corrected Belt Scale tonnes	kwatts conversion to tonnes	difference tonnes	amps conversion to tonnes	difference tonnes
April 15,02	126	6474.10	6474.10	6470.914	3.19	0	0
April 16,02	185	9552.40	9552.40	9404.079	148.32	9676.29	-123.89
April 17,02	145	7730.90	7730.90	7499.33	231.57	7753.309	-22.41
April 18,02	180	9451.50	9539.50	9412.356	127.14	9638.428	-98.93
April 19,02	166	8560.00	8665.00	8553.628	111.37	8737.455	-72.45
April 22,02	173	9138.00	9386.15	9447.105	-60.96	9465.383	-79.24
April 23,02	197	10453.00	10692.49	10717.322	-24.84	10323.369	369.12
April 24,02	159	7982.00	7982.00	8125.574	-143.57		
April 25,02	163	3705.00	3738.90	3773.876	-34.98		
April 26,02	164	8537.00	8757.00	8933.782	-176.78		
April 29,02	149	8150.00	8346.70	8418.175	-71.47		
April 30,02	156	8272.00	8482.00	8504.899	-22.90		
May 1,02	191	9901.00	10123.00	10138.142	-15.14		
May 2,02		10552.90	10758.00	10777.447	-19.45		
<b>TOTAL</b>		<b>118459.80</b>	<b>120228.13</b>	<b>120176.629</b>	<b>51.50</b>		

NOTE: Belt Scale tonnage was corrected for tonnage being added from April 18 to April 24th  
then taking off tonnage due to removal of rock end April 24 which had fallen on belt scale

NOTE: Apr 24 to May 2 scale was taking tonnes from scale display at 15 to 25 te/hr

NOTE:kwatt calibration formula used as per graph is  $37.1x - 146.91$  for all readings April 15 to May 2

NOTE: Amp calibration formula used as per graph is  $48.413x - 738.13$  for all readings

**FIGURE 8b****Comparison Table showing difference in GLOWE-TECH Analyzer Readings with Milltronics Belt Scale Readings**

Date	Operating Time hours	No-Load time hours	Start-Up time hours	Production time-hours	Milltronics tonnes	GT Analyzer tonnes	Difference tonnes	Difference %
06-May-02	7.367	1.813	0.064	5.490	2830.000	2769.730	60.270	2.13
07-May-02	10.930	2.176	0.196	8.558	4374.000	4377.165	-3.165	-0.07
08-May-02	7.117	1.796	0.027	5.294	2791.000	2776.820	14.180	0.51
09-May-02	6.830	1.187	0.116	5.527	3119.500	3096.503	22.997	0.74
10-May-02	10.650	1.242	0.044	9.364	4494.000	4531.777	-37.777	-0.84
13-May-02	10.430	7.158	0.007	3.265	1845.900	1888.235	-42.335	-2.29
14-May-02	8.817	5.402	0.031	3.384	1866.000	1866.000	0.000	0.00
15-May-02	10.867	1.502	0.080	9.285	4659.000	4680.243	-21.243	-0.46
16-May-02	11.033	2.380	0.011	8.642	4563.000	4582.861	-19.861	-0.44
17-May-02	9.067	1.620	0.009	7.438	3799.000	3761.421	37.579	0.99
20-May-02	8.967	1.389	0.009	7.569	3792.000	3791.384	0.616	0.02
21-May-02	10.883	1.778	0.009	9.096	4226.000	4199.993	26.007	0.62
22-May-02	10.750	1.620	0.138	8.992	3925.000	3921.740	3.260	0.08
23-May-02	7.880	1.311	0.009	6.560	3261.000	3206.395	54.605	1.67
<b>TOTAL</b>				<b>49545.400</b>	<b>49450.267</b>	<b>95.133</b>		

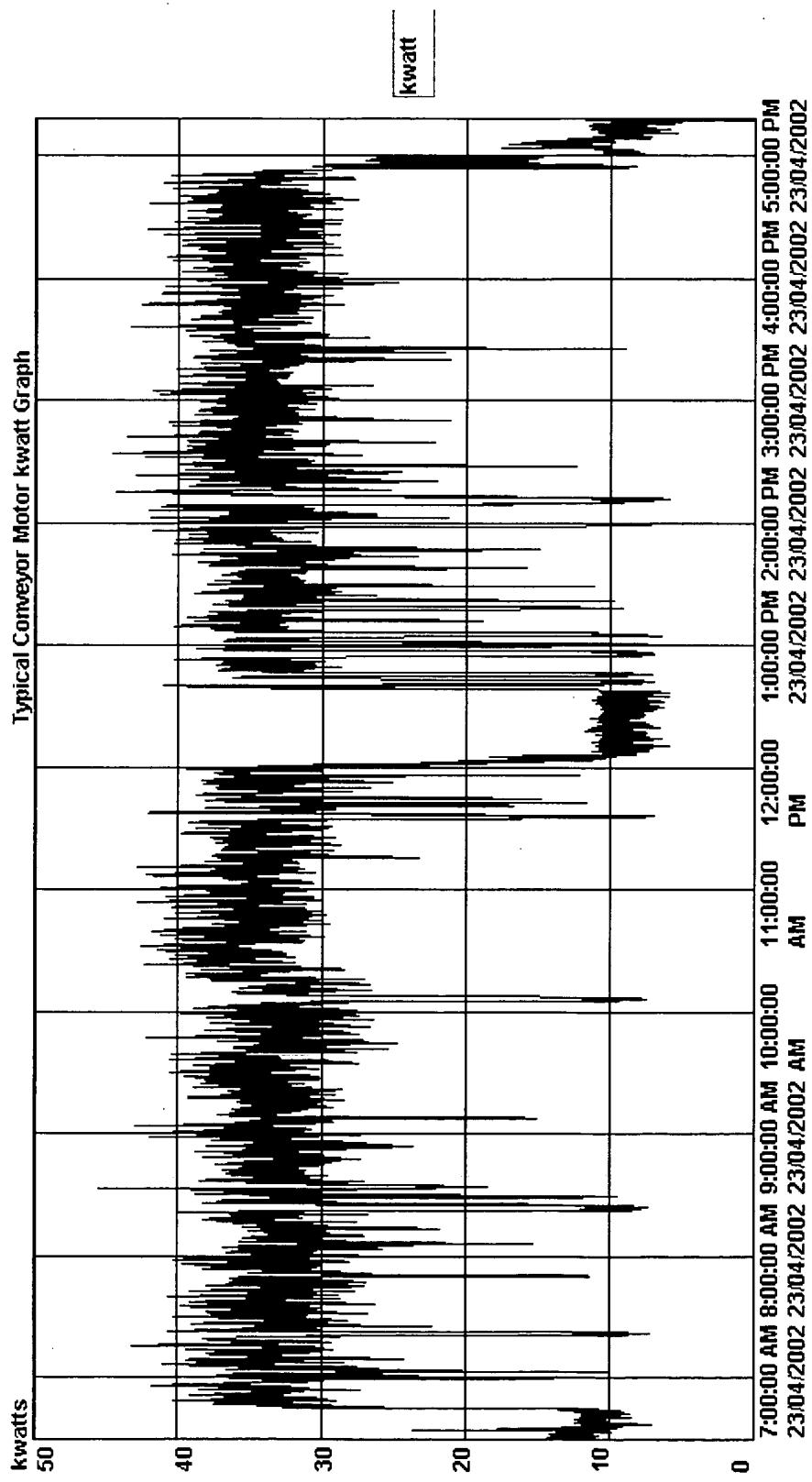


FIGURE: 9 kilowatt graph

FIGURE 10

## **TYPICAL Quarry Kwatts Converted to Tonnage Summary report**

Temperature am	10.000 Degrees Celsius
Temperature pm	17.000 Degrees Celsius
No load kwatt =	13.600
Start up kwatts =	21.000
Time No-Load kwatt	134.533 minutes
Time Start-Up kwatts	1.067 minutes
Total Production time	11.676 hours
Average kwatt for day	9.434 hours
Average Tonnage by formula	17.308 kwatts
	555.233 te/hr
Actual Scale Reading	5263.000 tonnes
Total tonnage by GT analyzer =	5237.943 tonnes
difference	-25.057
Time of data Reading	Actual Kwatt Count Reading No-Load
28/02/2003 6:00:05	0.1464615 1
28/02/2003 6:00:13	0.1708718 1
28/02/2003 6:00:21	0.1464615 1
Break	17.45333 0
28/02/2003 17:39:17	17.89272 0
28/02/2003 17:39:25	17.25805 0
28/02/2003 17:39:33	17.33128 0
28/02/2003 17:39:41	17.136 0
28/02/2003 17:39:49	15.57374 0
28/02/2003 17:39:57	14.7682 0
28/02/2003 17:40:05	14.42646 0
28/02/2003 17:40:13	13.66974 0
28/02/2003 17:40:21	13.03508 0
	5237.696 tonnes totalized
	-25.3040 tonnes
	Conditioned
	tonnes/hour on
	conveyor
	Tons/hr on
	conveyor
	1.254
	1.313
	1.227
	1.237
	1.211
	0.999
	0.890
	0.844
	0.741

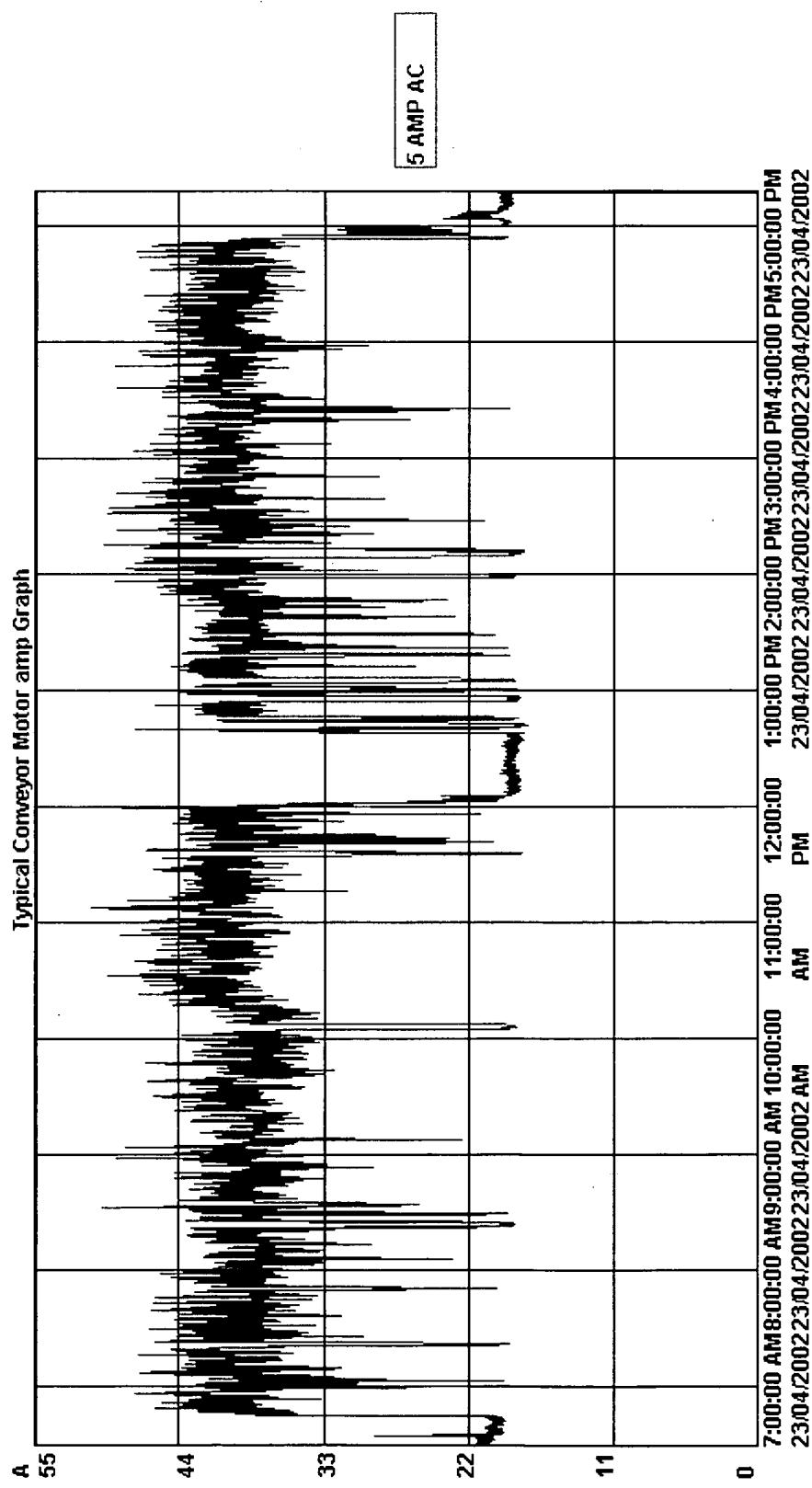


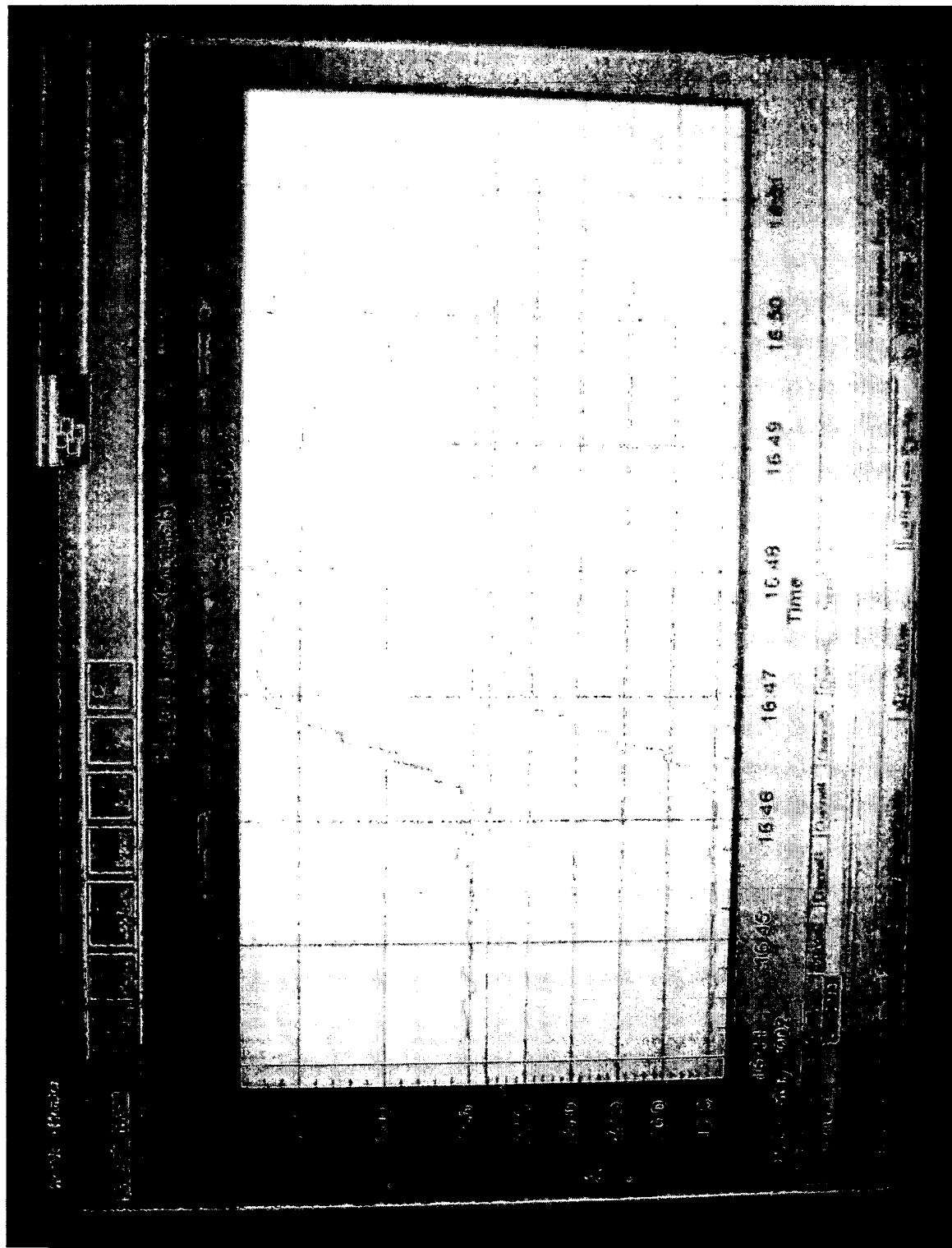
FIGURE: 11 ampere Graph

## TYPICAL Quarry Amps to tonnage Summary Feb 12, 2003

FIGURE 12

Temperature am		No load current =	25.000	degrees C
Temperature pm				15.000 degrees C
Time no load amps		Start up current =	80.000	1.156 hours
Time at start-up amps		69.33 minutes		0.098 hours
Total Recording Time		5.87 minutes		total hr production
Average current for day =		11.709 hours		amps
Average Tonnage by formula =		66.787	496.592	tonnes
Total tonnes by Instrument			5240.756	tonnes
Total tonnes by scale			5184.000	tonnes
Difference			-56.756 tonnes	-56.700 tonnes

Time of reading	Actual Amps	Count no load	Count > startup Amps	Conditioned Amps	Tons/ hour on conveyor	Tons/hr on conveyor
12/02/2003 6:00:04	20.30774	1	0	0	60.226	428.974
12/02/2003 6:00:12	20.26378	1	0	0	59.259	419.006
12/02/2003 6:00:20	20.26378	1	0	0	60.710	433.959
<b>BREAK</b>						
12/02/2003 17:41:00	60.222648	0	0	0	60.007	426.709
12/02/2003 17:41:08	59.255929	0	0	0	56.314	388.646
12/02/2003 17:41:16	60.71008	0	0	0	52.797	352.395
12/02/2003 17:41:24	60.00667	0	0	0	46.774	290.316
12/02/2003 17:41:32	56.31374	0	0	0	42.993	251.347
12/02/2003 17:41:40	52.79667	0	0	0	37.453	194.253
12/02/2003 17:41:48	46.77369	0	0	0	32.530	143.502
12/02/2003 17:41:56	42.99284	0	0	0	27.606	92.752
12/02/2003 17:42:04	37.45346	0	0	0	1	0
12/02/2003 17:42:12	32.52956	0	0	0		
12/02/2003 17:42:20	27.60566	0	0	0		
12/02/2003 17:42:28	24.57219					



**FIGURE 13a: - Typical Real Time Graph showing te/hr converted from Watt Transducer and a Real Time Graph of Amperage readings from the same Conveyor motor for parallel conversion to Tonnage for demonstration purposes.**

Typical Daily conversion kilowatts to tonnes Aug 5, 2003									
1	Typical Daily conversion kilowatts to tonnes Aug 5, 2003								
2									
3									
4	No load kwatt	Motor	7.403	kwatts					
5	Peak kwatts		33.800	kwatts					
6	Time No-Load kwatt	minutes	0.178	heures					
7	Time Start-Up kwatts	minutes	0.000	heures					
8	Total Production time	3.536	hours	3.358	heures				
9	Average kwatt for day								
10	Average Tonnage by formula	Motor	649.772	te/hre					
11									
12	Tonnage by belt scale		2201.000	tonnes est					
13	Total tonnage by GT analyzer =		2182.077	tonnes					
14	Difference		18.923	tonnes					
15	Percentage difference		0.860	%					
16	Time of data	Actual Kwatt	Count	Conditioned tonnes/hr on	te/hr				
	Reading	Reading	No-Load	Peak-load	kwatt	conveyor			
17	05/08/2003 6:16:26	-0.07618	1	0	10.842	179.824			
18	05/08/2003 6:16:34	10.84231	0	0	12.557	231.932			
19	05/08/2003 6:16:42	12.55725	0	0	14.482	290.409			
20	05/08/2003 6:16:50	14.48180	0	0	17.188	372.625			
21	05/08/2003 6:16:58	17.18750	0	0	20.751	480.895			
22	05/08/2003 6:17:06	20.75088	0	0	25.019	610.588			
23	05/08/2003 6:17:14	25.01919	0	0	29.173	736.806			
24	05/08/2003 9:46:34								
25	05/08/2003 9:46:42	29.02073	0	0	29.021	732.175			
26	05/08/2003 9:46:50	28.52530	0	0	28.525	717.121			
27	05/08/2003 9:46:58	28.54435	0	0	28.544	717.700			
28	05/08/2003 9:47:06	30.27635	0	0	30.278	770.388			
29	05/08/2003 9:47:14	29.34466	0	0	29.345	742.017			
30	05/08/2003 9:47:22	30.41174	0	0	30.412	774.441			
31	05/08/2003 9:47:30	29.49710	0	0	29.497	746.649			
32	05/08/2003 9:47:38	28.08703	0	0	28.087	703.804			
33	05/08/2003 9:47:46	29.36371	0	0	29.364	742.596			
34	05/08/2003 9:47:54	29.30565	0	0	29.307	740.860			
35	05/08/2003 9:48:02	29.11600	0	0	29.116	735.070			
36	05/08/2003 9:48:10	29.19222	0	0	29.192	737.386			
37	05/08/2003 9:48:18	29.00167	0	0	29.002	731.596			
38	05/08/2003 9:48:26	29.38277	0	0	29.383	743.175			
39		1	0	0					
40									
Calibration Formulas									
665.406 Ideal Formula Number									
590.903 01/08/2018, formula 1									
631.737 01/09/2015, formula 2									
652.916 Jun 20.03, Formula 3 currently used									
6.965 Average kw									
0.293 Std dev									
7.403 1.5 std dev									
7.550 2.0 std dev									
7.03132									
7.12659									
7.62202									
6.95510									
6.95510									
7.16470									
7.06943									

Figure 13b Typical Daily Summary Table with Stable No-Load reading

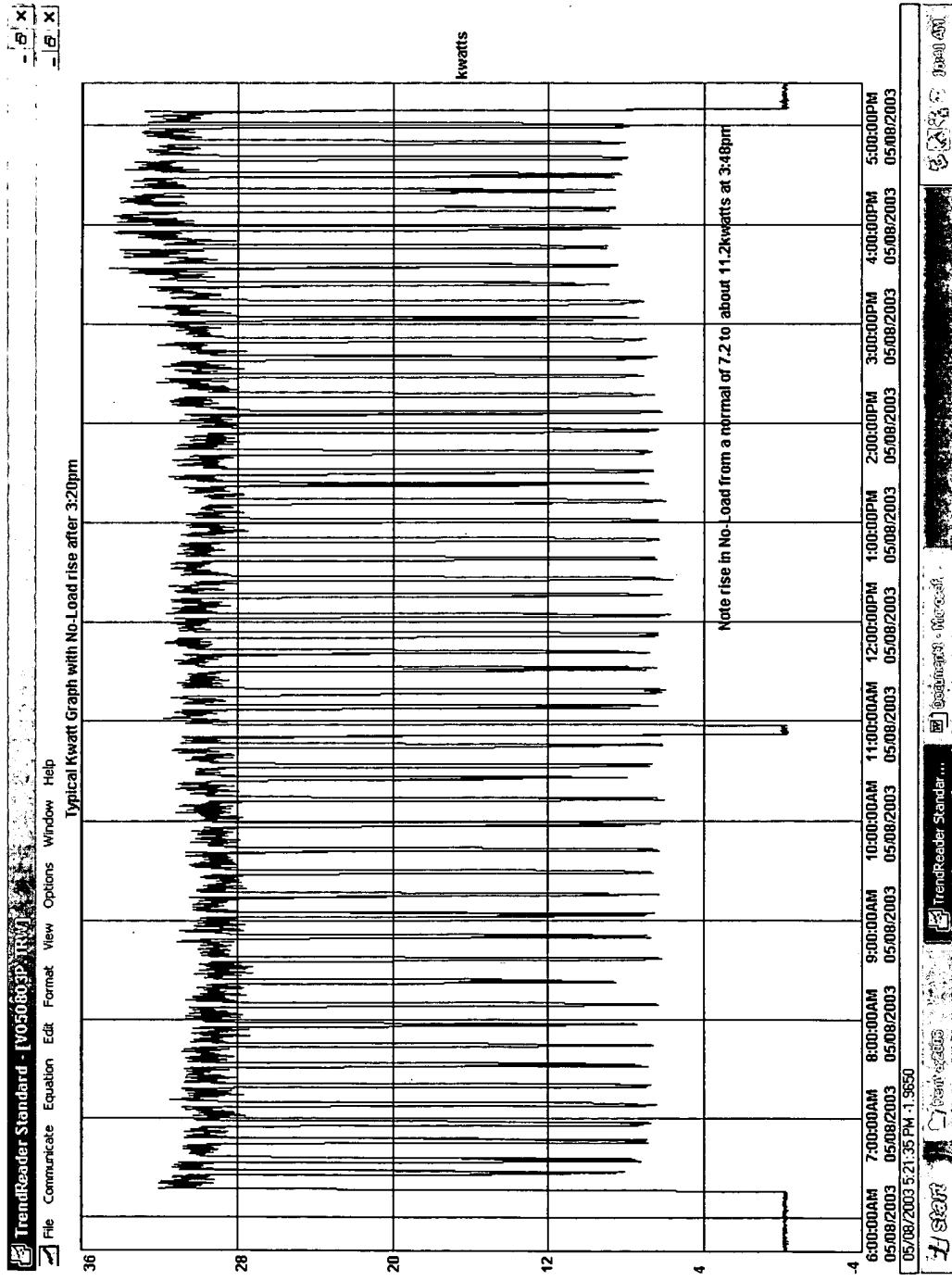


FIGURE 13d Typical Kilowatt Graph showing effect of change in No-Load caused by Friction on return side of Conveyor

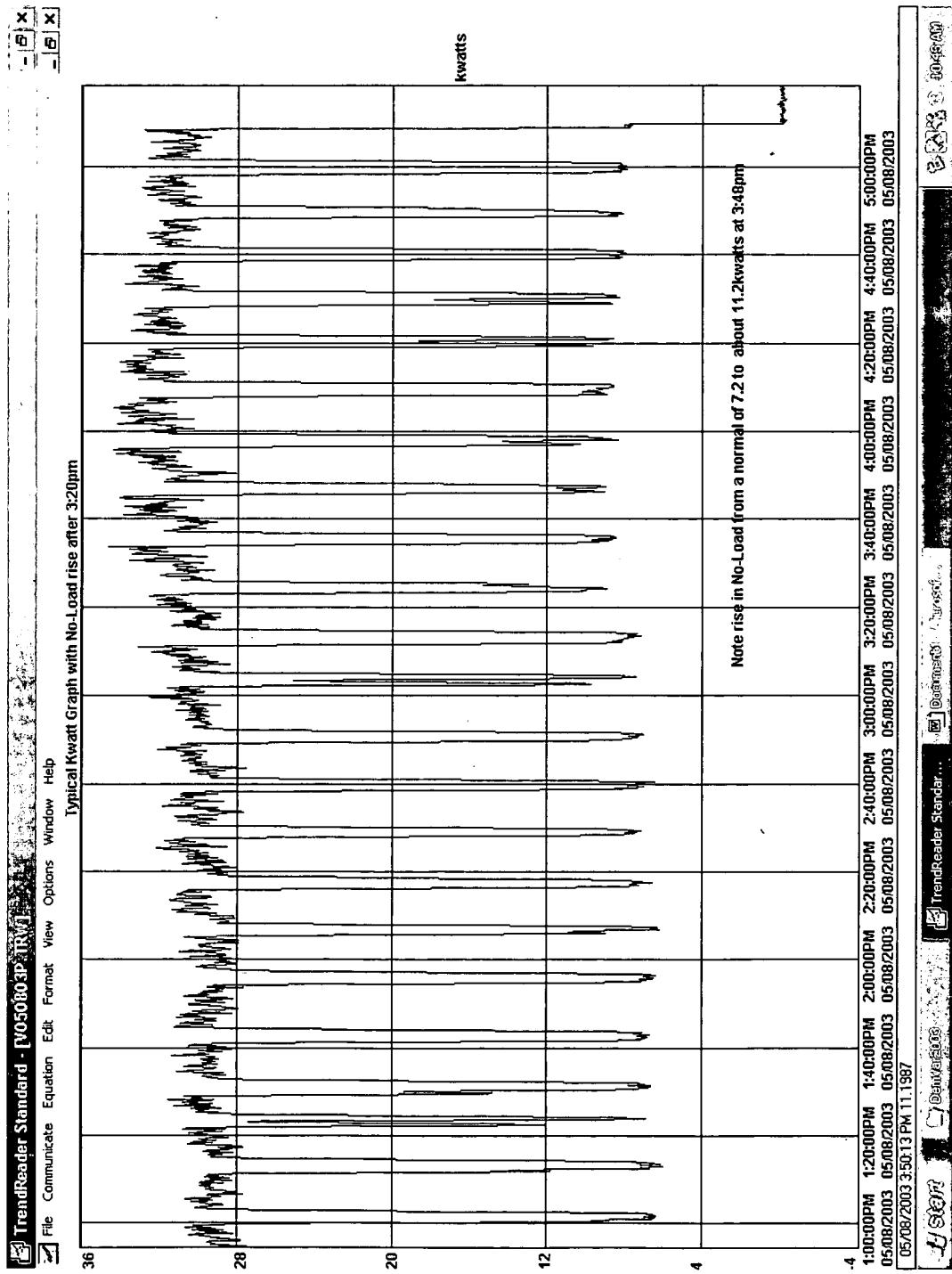


Figure 13e Enlarged view of change in No-Load readings caused by friction on Return Conveyor belt

Figure 13f Daily Summary Showing Impact of No-Load Adjustment due to dirt build up at 3:20pm

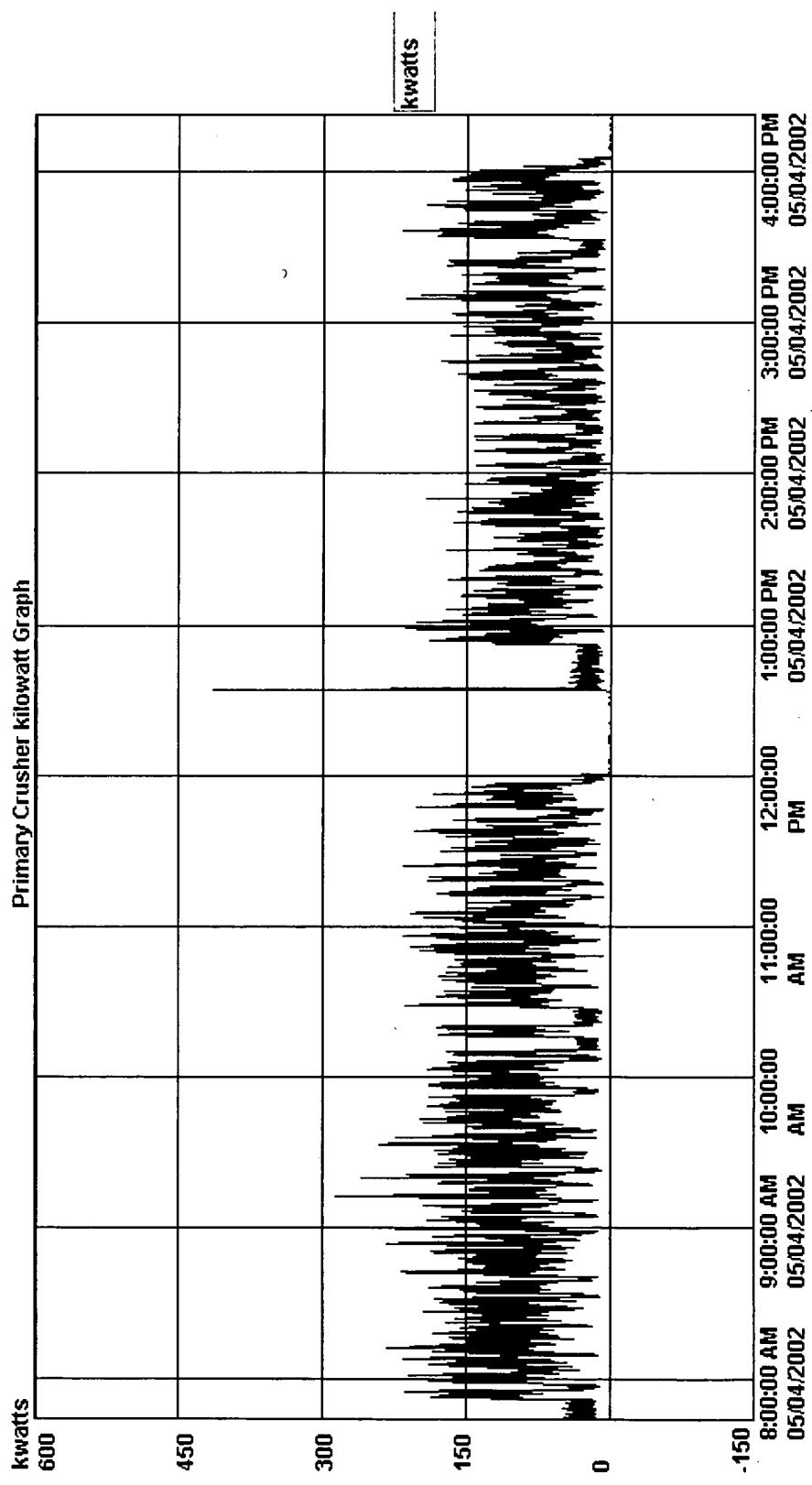


Figure 14: Typical Primary Crusher Graph

## FIGURE 15

### Typical Primary Crusher kwatt report April 5, 2002

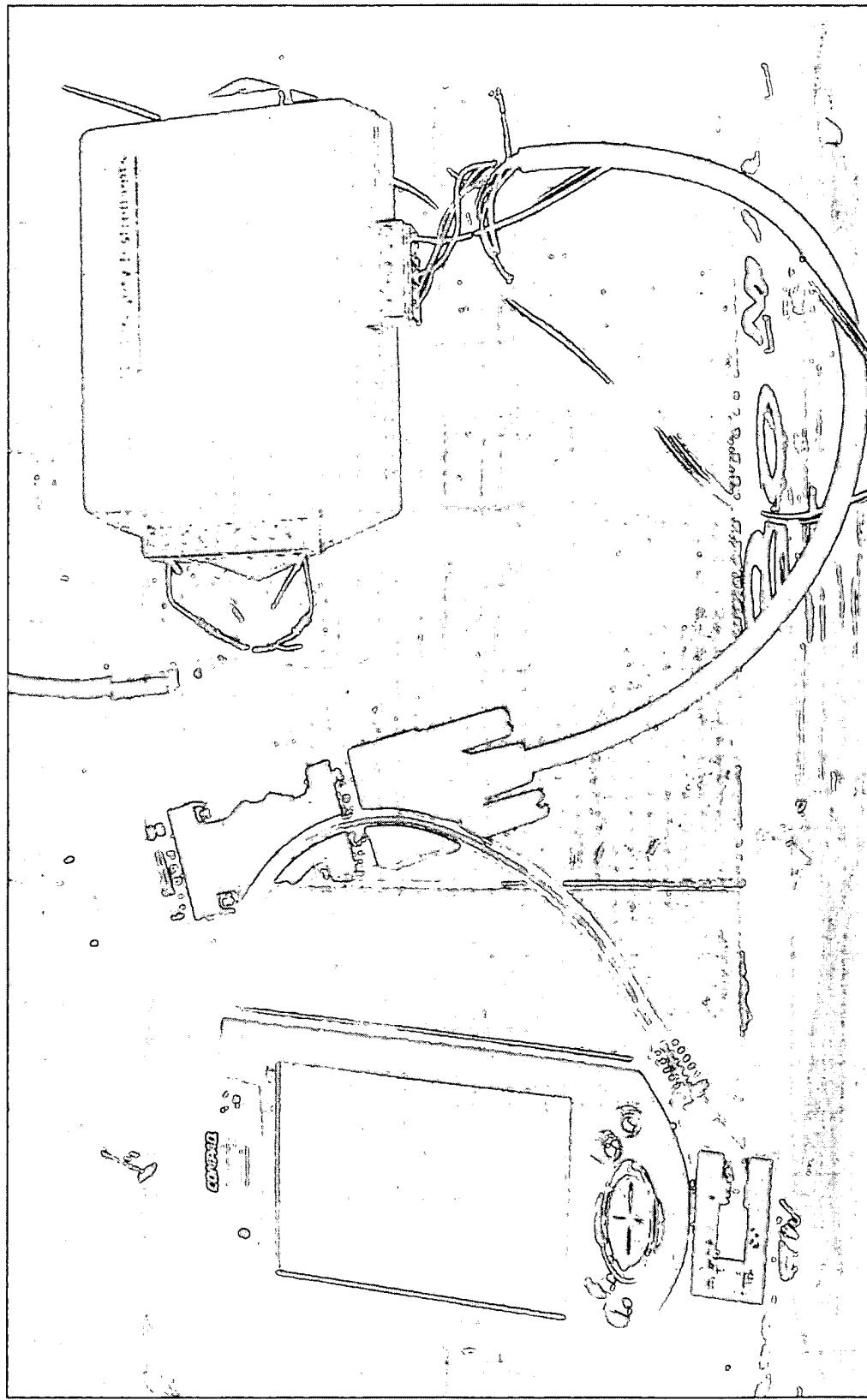
No load kwatt =	30.000 kwatts			
Start up kwatts =	410.000 kwatts			
Time No-Load kwatt	144.400 minutes			
Time Start-Up kwatts	0.133 minutes			
Total production time 10 hrs 23 min	10.383 hours			
Total tonnes on Primary Conveyor Belt Scale	7.974 hours actual			
Average kwatt for day	7713.0 tonnes			
Total kwatts crushing	91.785			
Total te/kwatt crushed	731.906 kwatts			
	10.538 te/kwatt			
Time of data Reading	Actual Kwatt	Count No-Load	Count Over-load	Conditioned kwatt
05/04/2002 7:24:33	0.811	1	0	
05/04/2002 7:24:41	4.358	1	0	
05/04/2002 7:24:49	1.520	1	0	
05/04/2002 7:24:57	0.811	1	0	
05/04/2002 7:25:05	0.811	1	0	
05/04/2002 7:25:13	2.027	1	0	
05/04/2002 7:25:21	2.939	1	0	
05/04/2002 7:25:29	3.851	1	0	
05/04/2002 7:25:37	2.230	1	0	
05/04/2002 7:25:45	3.243	1	0	
05/04/2002 7:25:53	1.317	1	0	
05/04/2002 7:26:01	2.331	1	0	
05/04/2002 7:26:09	2.939	1	0	
05/04/2002 7:26:17	1.013	1	0	
05/04/2002 7:26:25	0.811	1	0	
05/04/2002 7:26:33	1.926	1	0	
05/04/2002 7:26:41	2.534	1	0	
05/04/2002 7:26:49	1.115	1	0	
05/04/2002 7:26:57	0.811	1	0	
05/04/2002 7:27:05	0.811	1	0	
05/04/2002 7:27:13	0.811	1	0	
05/04/2002 7:27:21	0.811	1	0	
05/04/2002 7:27:29	4.155	1	0	
05/04/2002 7:27:37	0.709	1	0	
05/04/2002 7:27:45	0.811	1	0	
05/04/2002 7:27:53	0.811	1	0	
05/04/2002 7:28:01	0.709	1	0	
05/04/2002 7:28:09	0.709	1	0	
05/04/2002 7:28:17	3.952	1	0	
05/04/2002 7:28:25	2.736	1	0	
05/04/2002 7:28:33	0.811	1	0	
05/04/2002 7:28:41	389.056	0	0	389.056
05/04/2002 7:28:49	53.306	0	0	53.306
05/04/2002 7:28:57	55.739	0	0	55.739
05/04/2002 7:29:05	51.178	0	0	51.178
05/04/2002 7:29:13	41.247	0	0	41.247

FIGURE 16

**TYPICAL QUARRY**      **Kwatts**      **Tonnage report**      **Apr 3, 2003 With TEMPERATURE Effect**

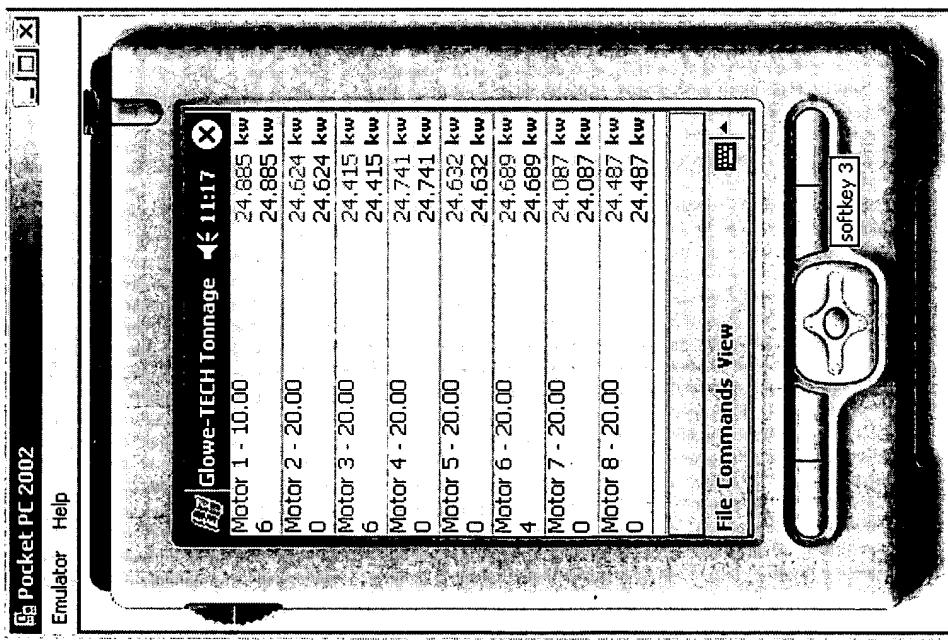
Temperature am	-6.800 Degrees Celsius	formula	temperature
Temperature pm	-5.700 Degrees Celsius		-19
No load kwatt =	12.400	203.846	
Start up kwatts =	21.000	222.018	Jan-30
Time No-Load kwatt	10.000 minutes	310.794	Apr-03
Time Start-Up kwatts	0.000 minutes		-6.5 used
Total Production time	2.058 hours		
Average kwatt for day	1.891 hours		
Average Tonnage by formula	14.018 kwatts		
Actual Scale Reading	310.794 te/hr		
Total tonnage by GT analyzer =			
difference			
Time of data Reading	Actual Kwatt	Count	
03/04/2003 14:07:38	14.69497	No-Load	Conditioned
03/04/2003 14:07:46	14.06031	Over-load	tonnes/hour on
03/04/2003 14:07:54	13.37682	0	conveyor
		0	Tonnes on conveyor
		2.814 tonnes	
			1.9410 tonnes
			586.941 tonnes totalized
			585.000 tonnes
			587.814 tonnes
			310.794 te/hr
BREAK	03/04/2003 16:09:46	12.8398	0
	03/04/2003 16:09:54	12.66892	0
	03/04/2003 16:10:02	12.59569	0
	03/04/2003 16:10:10	12.86421	0
	03/04/2003 16:10:18	12.98626	0
	03/04/2003 16:10:26	12.88862	0
	03/04/2003 16:10:34	13.0839	0
	03/04/2003 16:10:42	13.13272	0
	03/04/2003 16:10:50	13.23036	0
	03/04/2003 16:10:58	13.25477	0

Figure 21 PDA & Analog Data Logger wiring hook-up



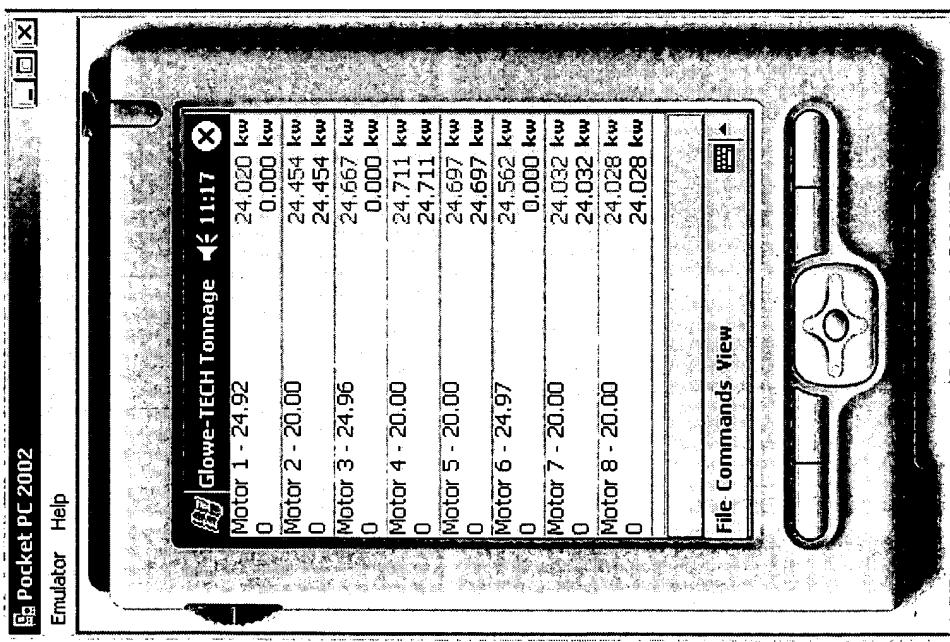
# Figure 23 PDA Tonnage Analyzer

- Motor view with kwatt values and a zero test in progress for motors 1, 3, and 6. Zero test will confirm no-load operating conditions and any changes will be automatically incorporated in calibration formula.



# Figure 24 PDA Tonnage Analyzer

- Motor view with kwatt values and finished zero tests with new No-load values for motors 1, 3, and 6. All future tonnage conversions will be based on new No-Load values.

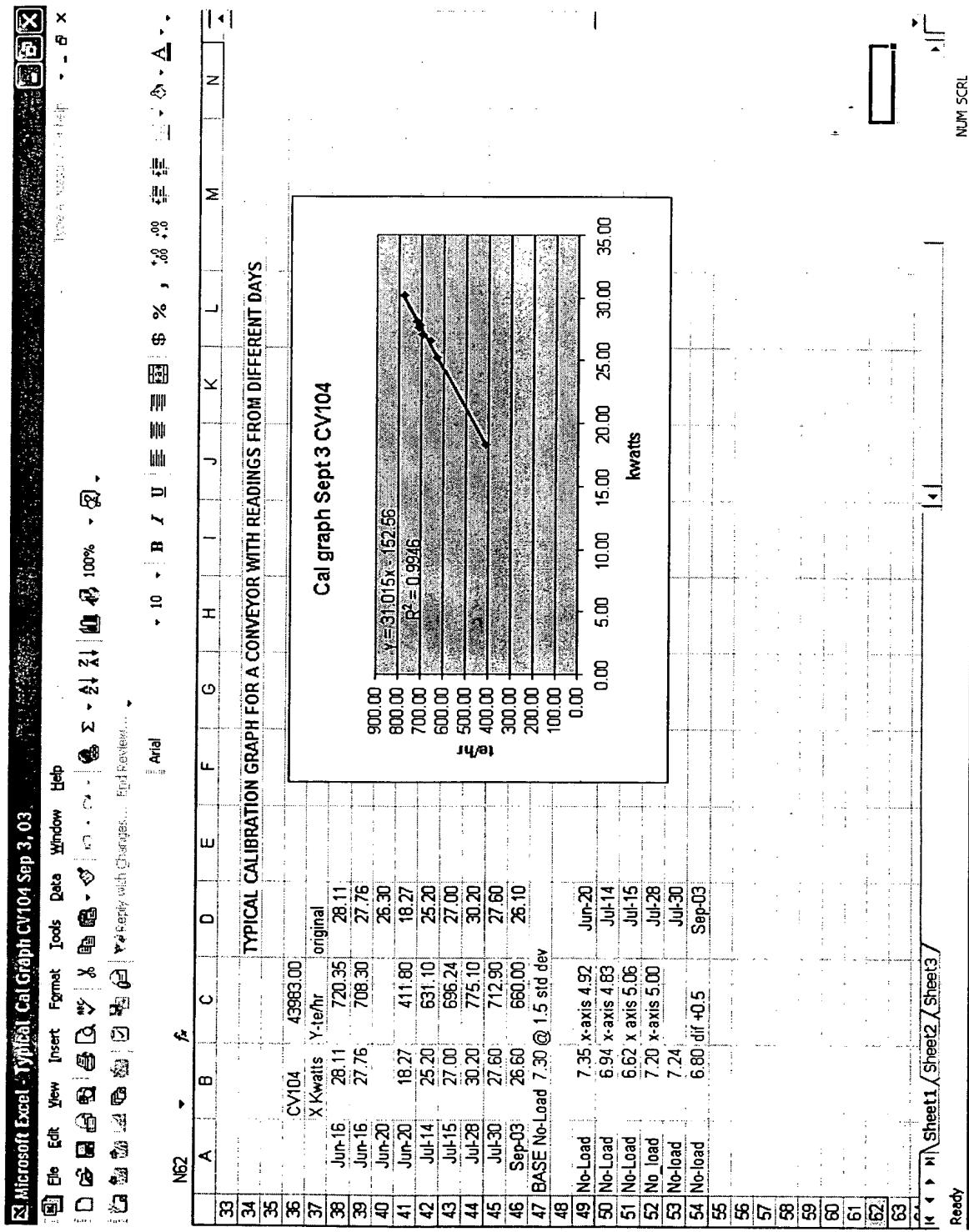


# Figure 25 PDA Tonnage Analyzer

- Daily Summary Report including Total tonnage, Production time, No-Load time and new No-load calibration value.

110903 124325.txt - Notepad

File	Edit	Format	Help
Start	11/09/03 12:27:28		
End	11/09/03 12:43:22		
11/09/03			
Nom	Te Total	Temps de Production	Temps de NoLoad
CV 212	58.26376	00:14:12	00:01:40
CV 213	57.84868	00:14:04	00:01:48
CV 214	58.58227	00:14:16	00:01:36
			NoLoad
			24.91902
			24.90978
			24.95023



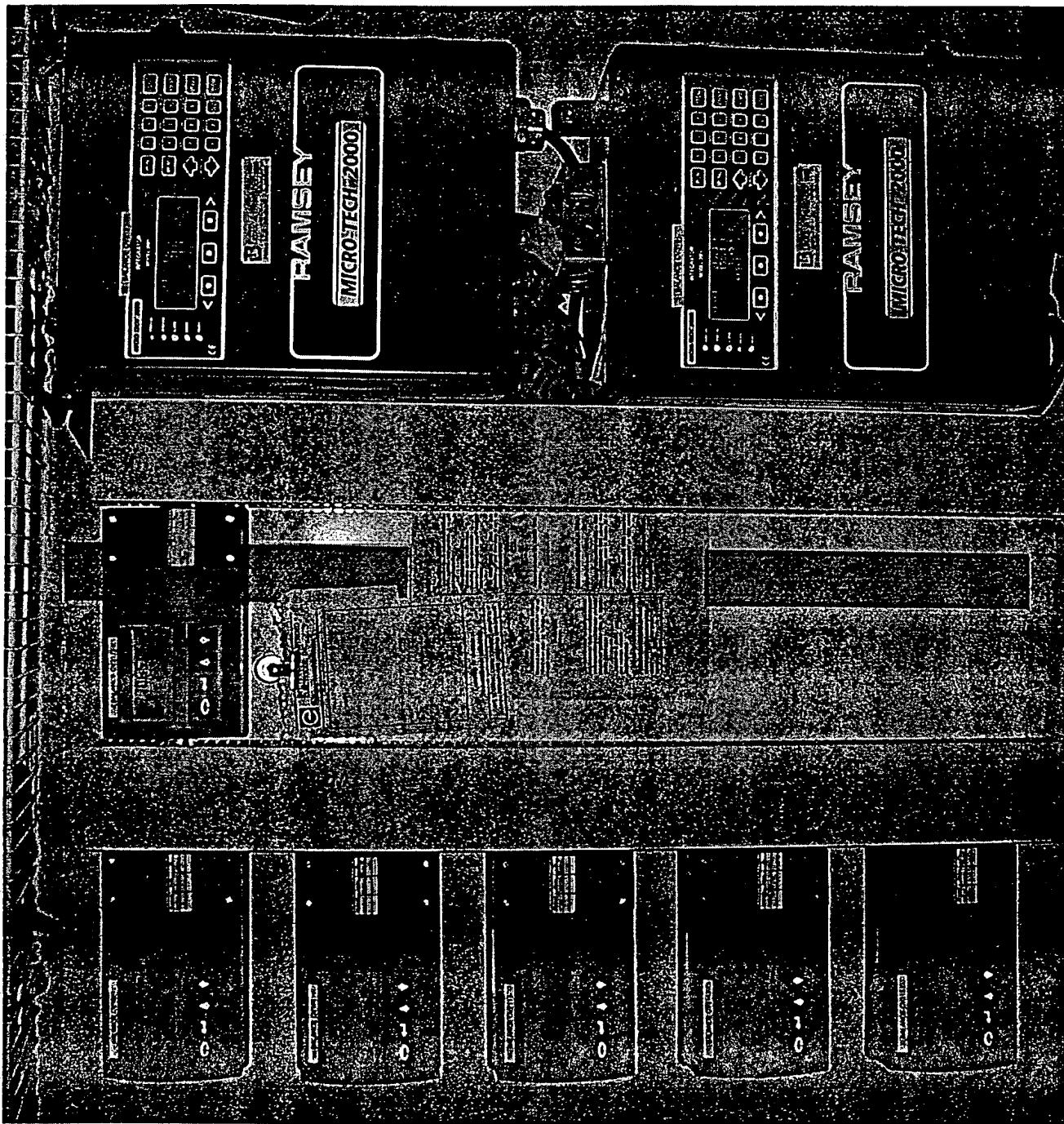


Figure 16a

# Glowe-Tech Tonnage Analyzer

- Real Time Program showing total tonnage, tph, production time, and No-Load time values

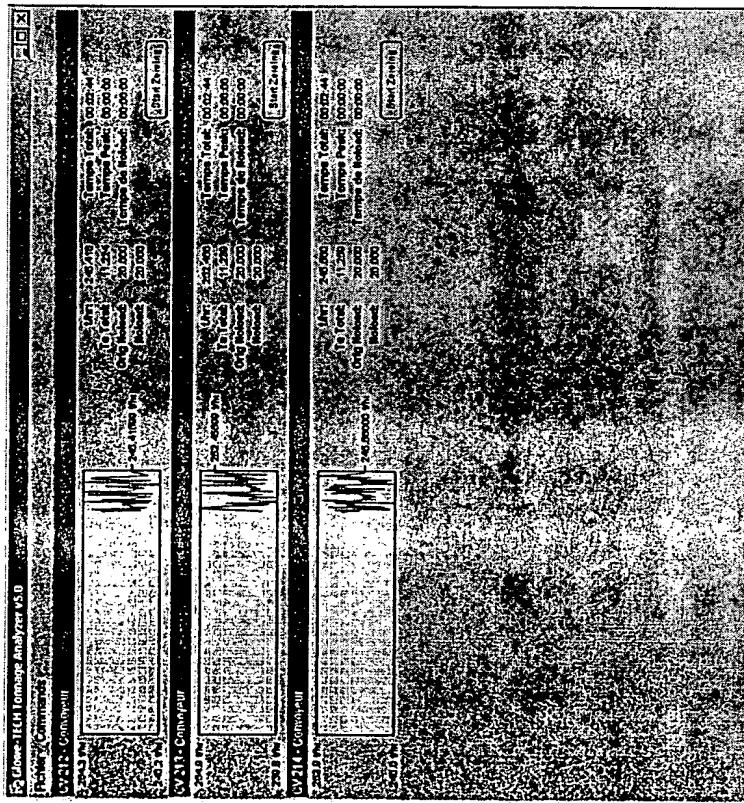


Figure 17

# Glowe-Tech Tonnage Analyzer

- Zero test activated as shown in Red

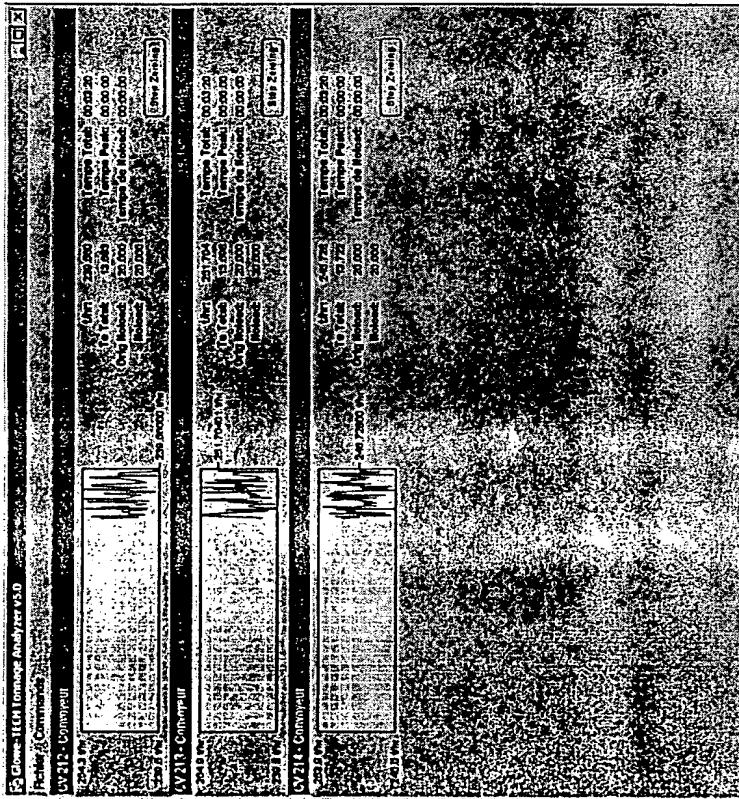


Figure 19

# Glowe-Tech Tonnage Analyzer

- Running with tonnage values totalized and shown as tph, updated every second.

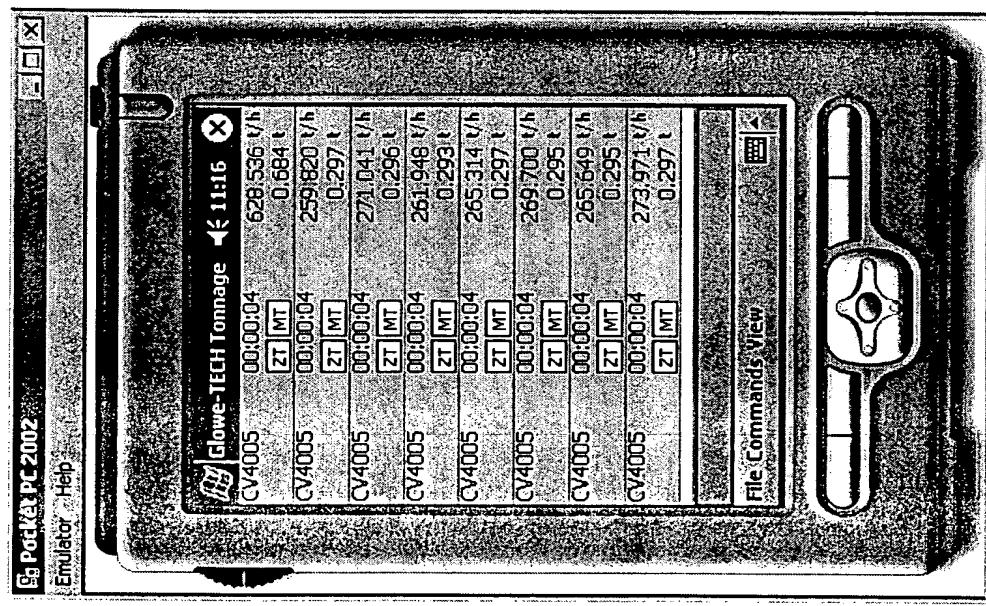


Figure 22

# Glowe-Tech Tonnage Analyzer

- Program startup with graphic display of last 20 minutes of data in Real Time.

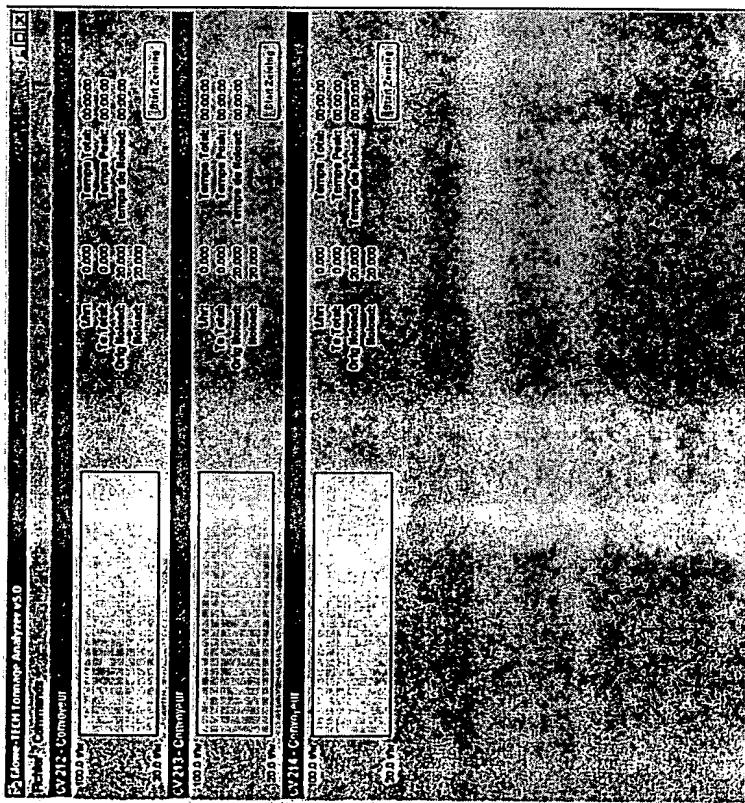


Figure 20

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